FOREST PEST CONDITIONS IN CALIFORNIA- 1977

A PUBLICATION OF
THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

THE CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL was founded in 1951. Its membership is open to public and private forest manager, foresters, entomologists, pathologists, zoologists, and others interested in the protection of forest from damage caused by animals, insects, and diseases. Its objectives is to establish, maintain, and improve communication among individuals -- managers, administrators, and researchers -- who are concerned with these problems. This objective is accomplished by four actions:

1. Coordination of detection reporting and compilation of pest damage information.

2. Evaluation of pest conditions.

3. Pest control recommendations made to forest managing agencies and owners.

4. Review of policy, legal, and research aspects of forest pest control, and submission of recommendation thereon to appropriate authorities.

The State Board of Forestry recognizes the Council as an advisory body in forest pest protection. The Council is a participating member in the Western Forest Pest Committee of the Western Forestry Conservation Association.

THIS REPORT, FOREST PEST CONDITIONS IN CALIFORNIA - 1977, is compiled for public and private forest land managers to keep them informed of pest conditions on forested land in California, and as an historical record of pest trends and occurrences. The report is based largely on information provided by the Statewide Cooperative Forest Pest Detection Survey; in 1977, 275 reports were received: 140 for insect pests, 100 for diseases, and 35 for animal pests.

The report was prepared by the Forest Service in cooperation with other member organizations of the Council.

COVER PHOTO. A severely weakened and deformed dwarf mistletoe - infected ponderosa pine.

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HIGHLIGHTS OF PEST CONDITIONS - 1977

STATUS OF INSECT PESTS. The rising trend in tree killing that began in 1976 continued in 1977. By early fall, the increase is most apparent in the low elevation ponderosa pine type throughout northern California north of the Tehachapi Mountains. The death of young and old-growth sugar pine apparently also increased many-fold in 1977 as did tree mortality in the east-side pine type.

This increase in tree mortality is expected to continue in 1978 and is considered to be directly related to the unprecedented drought in northern California over the last two years. Tree mortality is greatest in stands where growing conditions, even in times of adequate moisture, are less than satisfactory. Some contributing factors are over-stocking; shallow soils, especially on ridge tops; moderate-to-heavy dwarf mistletoe infections; root diseases; and disturbances such as recent road construction and winter and spring logging with inadequate slash disposal.

Because tree mortality is expected to continue at a high level into 1978, all forest land managers were again urged to maintain or increase salvage programs emphasizing prompt removal of dying trees for sanitation and optimum recovery of volume and grade.

Southern California, long known for frequent periods of drought, has experienced near normal precipitation since 1973 and the level of tree mortality is at an all time low.

The status of defoliators was mixed: the lodgepole needle miner infestation at Yosemite National Park increased greatly in area and severity. The Jeffrey pine needle miner infestation remained unchanged. Locally, high densities of white fir sawfly larvae were noted, but no defoliation was reported; sharp rises in catches of male Douglas-fir tussock moths in synthetic-pheromone baited-stickly-traps may portend defoliation of white fir by this insect in 1978; two usually innocuous defoliators, the silver spotted tiger moth and tent caterpillars, each caused severe defoliation over several thousand acres of host trees -- each infestation is expected to collapse in 1978.

STATUS OF DISEASES. The continuing drought was a major concern this year. There was little evidence that drought alone killed trees. However, many trees weakened by root diseases and/or dwarf mistletoe were killed by the drought. Also the drought predisposed trees to successful attack by bark beetles.

Preliminary results of biological evaluations conducted on the San Bernardino and Cleveland National Forests indicate that insect/disease complexes (root disease, dwarf mistletoes, bark beetles and flatheaded borers) caused approximately 80% of the tree mortality there.

Both Federal (F) and State (S) nurseries suffered losses due to Fusarium sp. At Placerville (F) and Magalia (S) Nurseries 1-0 sugar pine and red fir were affected. At Humboldt (F) Nursery the problem was in the 1-0 Douglas-fir.

STATUS OF ANIMAL PESTS. The pocket gopher, porcupine and deer continue to be the three mammal species causing the most significant damage to commercial conifer forests.

STATUS AND CONTROL OF INSECT PESTS

DOUGLAS-FIR TUSSOCK MOTH, Orgyia pseudotsugata. Douglas-fir tussock moth larval populations have remained at low level since the 1970-1973 outbreak, but showed some moderate increases over 1976 densities. The adult male moth catch in population assessment pheromone traps was considerably greater than in 1976. Pupal/egg mass samples will be taken this fall and egg mass/larval samples in the spring of 1978 to determine the significance of this increase.

The cooperative efforts involving the California Region and the Pacific Southwest Forest and Range Experiment Station of the Forest Service, and the University of California, under the auspices of the expanded USDA Douglas-fir Tussock Moth Research and Development Program, will be concluded in 1977. Results of the program will be published, in part, as a Compendium by September, 1978.

GYPSY MOTH, Lymantria dispar. Aggressive action by the California Department of Food and Agriculture, Animal and Plant Health Inspection Service and Santa Clara County has apparently erradicated the gypsy moth infestation at Willow Glen near San Jose. An intensive trapping program failed to catch a single male moth there in summer 1977.

DOUGLAS-FIR BEETLE, Dendroctonus pseudotsugae. Tree killing by the Douglas-fir beetle remained at a comparatively low level through 1977, although late summer observations indicate some increase in activity in the Sierra Nevada. At one location in El Dorado County, tree killing may have been provoked by disturbance associated with construction at the nearby Auburn Dam site. Near Grizzly Peak, Plumas County, currently infested group tree kills are scheduled for salvage by spring of 1978.

WESTERN PINE BEETLE, Dendroctonus brevicomis. From Tulare County north, western pine beetle activity is reported to be up considerably over that of 1976. Tree mortality appears greatest in the lower elevation pine type of the Sierra Nevada in the approximately 3000 to 4000 foot elevational zone. Frequently, pine engraver beetles and the drought are implicated as contributing to the death of the trees, along with more localized site properties and stand conditions such as overstocking, shallow soils and recent logging disturbance.

Some areas with unusually high numbers of dead trees are in the vicinity or Arnold and Rattlesnake Hill, Calaveras County; Todd Valley and Iowa Hill, Placer County; Slab Creek Reservoir and Beanville, El Dorado County; Nevada City, Nevada County; Lake Oroville, Butte County; Dogwood Creek and Chambers Peak, Plumas County; the Burney-Hat Creek area and east of Buckhorn Summit on Highway 299, Shasta County.

FIR ENGRAVER, Scolytus ventralis. As in 1976, scattered top and whole tree killing was observed throughout much of the host range. At five locations, namely Butte Mountain, Siskiyou County; Adin Summit, Modoc County; Emigrant Gap, Placer County; and Ferris Cabin and Thompson Peak, Plumas County, the level of damage was great enough to cause concern to the land managers. At these locations, root diseases (specifically Fomes annosus) or drought were either confirmed or suspected as predisposing the trees to attack by the fir engraver.

FLATHEADED FIR BORER, Melanophila drummondi. Douglas-fir tree mortality in northwest California has reportedly tapered off from that of 1975-1976 suggesting a parallel drop in flatheaded fir borer activity in that area.

CALIFORNIA FLATHEADED BORER, Melanophila californica. California flatheaded borer activity is at a low ebb in southern California. In northern California however, evidence of flatheaded borer damage seems more readily apparent in Jeffrey, sugar and ponderosa pine trees stressed by drought, dwarf mistletoe, and various other factors.

PINE ENGRAVER BEETLES, Ips spp. Damage by pine engravers increased markedly over that of 1976. Several instances were reported where ips beetles alone caused considerable top and whole tree killing. Additionally, most reports which listed mountain pine beetle, western pine beetle or Jeffrey pine beetle as a causal agent also lists Ips spp. as contributing to the death of the trees.

Some noteworthy locations of Ips spp. activity were at San Pablo Reservoir, Contra Costa County; Hathaway pines, Calaveras County; Glenhaven and Salminas Road, Lake County; vicinity of Montgomery Creek and east of Buckhorn Summit of Highway 299, Shasta County. Factors mentioned as contributing to the elevated ips damage were the drought, logging slash, dwarf mistletoe and transition zones between lower elevational tree species.

RED TURPENTINE BEETLE, Dendroctonus valens. At San Pablo Reservoir, Contra Costa County, red trupentine beetles and engraver beetles are principally responsible for high level mortality in Monterey pine plantations established there in the early 1930's. Because Monterey pine is not native to the area and such stands become increasingly susceptible to pest problems after about 40-50 years of age, no suppression action is recommended. Instead, regeneration of the affected areas with native shrubs, oaks, and grasses seems the preferred course of action to take.

MOUNTAIN PINE BEETLE, Dendroctonus ponderosae. As with all the species of pine bark beetles, damage associated with the mountain pine beetle was up considerably in 1977. The most significant and widespread increase in damage was to sugar pine; some increase in damage was noted in ponderosa pine, but it was more localized in nature. In previous years, killing of scattered large sugar pine was frequently reported -- often these kills were the result of lightning strikes with subsequent fill in by beetles. This year, the incidence of dying sugar pine has risen sharply; both young and old-growth trees are affected; and group tree killing is in evidence. These observations suggest that the drought is a major predisposing factor.

Notable increases in sugar pine mortality were located at Colby Mountain and Onion Butte, Butte County; vicinity of Mosquito Creek and Hat Creek, Shasta County; Corral Bottom, Trinity County; Fiddletown Road, Amador County; and vicinity of Plummer Ridge, El Dorado County.

JEFFREY PINE BEETLE, Dendroctonus jeffreyi. Jeffrey pine beetles caused increased tree killing at Silverfork and Alder Creek, El Dorado County; Carmen Valley and near the junction of Highways 89 & 49, Sierra County; along Lake Davis Road and the vicinity of Antelope Lake, Plumas County; and at Honey Lake, Lassen County. In the Antelope Lake infestation, an estimated 700 MBF of infested material was removed from the woods in winter and spring salvage operations. Drought conditions, ips beetles and needle cast disease were mentioned as factors contributing to the death of the trees.

TENT CATERPILLARS, Malacosoma spp. On the Tule River Indian Reservation, Tulare County, tent caterpillars defoliated some 2000 acres of mountain mahogany and blue oak for the second consecutive year. This infestation is centered around the heavily used Chilolo Campground, giving rise to Tribal concerns as to the effect continued defoliation may have on recreational use of the area.

SILVER SPOTTED TIGER MOTH, Halisidota argentata. At Eden Valley-Elk Creek in Mendocino County, epidemic numbers of the silver spotted tiger moth caused nearly complete defoliation of all plant species including Sargent cypress, digger pine, ponderosa pine and madrone on some 2500 acres. Ground checking showed healthy larvae feeding only in a narrow fringe on the border of the infestation -- in the heavily defoliated central portion, dead and dying larvae were found in abundance suggesting death from starvation and exposure.

WHITE FIR SAWFLY, Neodiprion spp. No damaging infestations of white fir sawflies were reported in 1977 although larvae were present and often abundant throughout much of the host type.

LODGEPOLE NEEDLE MINER, Coleotechnites milleri. Needle miner densities increased at nearly all population monitoring locations in Yosemite National Park. Increases in excess of 500 percent were observed on 10 of 26 plots.

At some locations however, the densities were static or declined because populations reached maximum sustainable densities in the previous generation.

The total area showing visible defoliation increased greatly. Newly defoliated areas of particular interest were along Highway 120, east of Tenaya Lake and east of Tuolumne Meadows; along the John Muir Trail; and in Lyell Canyon.

Warm, dry weather occurred during the flight period. Preliminary sampling of new populations indicate further increases and defoliation of Tuolumne Meadows Campground is predicted for 1979.

No control action is planned by the National Park Service.

WHITE FIR NEEDLE MINER, Epinotia meritana. The persistent, high level white fir needle miner population at Manzanita Mountain, Modoc County collapsed in 1977. However, the two-to-three successive years of defoliation apparently killed several hundred white fir trees in many large groups.

INSECTS DAMAGING PLANTATIONS AND YOUNG TREES. Pine sawflies and the pine resin midge, Cecidomyia piniiopis were the two insects most frequently reported as causing injury to young trees. At Humboldt Nursery (F), an increasing and damaging infestation of cooley spruce gall aphids, Adelges coaleyi on Douglas-fir seedlings was treated with a carbaryl formulation. A coneworm, Dioryctria spp. attacked 45 percent of some 500 grafted, but unprotected ponderosa pine, at the Forest Service Tree Improvement Center at Chico in Butte County.

SURVEYS AND EVALUATIONS

NORTHERN CALIFORNIA DROUGHT SURVEY. A survey of the tree mortality on drought-stricken National Forests of California was made this year. A total of 160-280-acre plots was randomly chosen, photographed and interpreted for trees which died between May 1976 and May 1977. These trees would have died during the 1976 drought stress period. A sample of mortality groups identified on these photos was chosen for a ground checking (sampling). These 115 ground plots were visited early this fall.

As of May 1977 on 6,331,940 acres of commercial forest land in the 12 northern National Forests an estimated 6,452,282 ± 1,163,846 trees, with an estimated volume of 3,095,795,297 ± 648.588.702 board feet died during the 1976-77 drought. This is approximately 1 tree per acre. The majority, 85%, of the volume loss occurred on the better sites (sites A, 1, and 2). In regards to forest type, 78% of the volume loss occurred in the mixed conifer and red fir types.

Although the current drought was a majority of these losses. These pests appeared to play one of two roles. The long-term endemic diseases such as root disease and dwarf and true mistletoes predisposed the trees to drought stress while the bark beetles and flatheads killed the drought stressed trees.

The estimated 3 billion board feet of loss is only part of the loss to be expected from the 1976-77 drought.

SAN BERNARDINO MOUNTAINS. This year the University of California and the Forest Service continued the evaluation of the extent and causes of tree mortality begun in 1976 in the San Bernardino Mountains. The data collected in 1976 indicate that a total of 11,243 trees died between June 1975 and June 1976, and that 78% of these trees were killed by insect/disease complexes. The major pests associated with this mortality in order of frequency of occurrence were: Fomes annosus, fir engraver beetle, Jeffrey pine beetle, dwarf mistletoe, roundheaded borer, pine engraver beetle, Armillaria, and California flatheaded borer. Of the total number of dead trees, 6.3% had moderate to severe ozone injury symptoms, 37.9% had very slight to slight ozone symptoms and 45.7% showed no ozone injury symptoms. In the 4,572 Jeffrey pine which died, the major associated pests in order of frequency were: Jeffrey pine beetle, dwarf mistletoe, California flatheaded borer, F. annosus and pine engraver beetle. The mortality in true fir was 4,592 trees in which fir engraver beetle, F. annosus, and roundheaded borers were the most commonly associated pests.

LAGUNA MOUNTAIN EVALUATION. A survey of the dead trees and associated pests was made this spring-summer by the Forest Service on the Laguna Mountains of the Cleveland National Forest. A total of 4,182 trees or an average of .64 trees per acre died between April 1976 and April 1977. The pests most frequently associated with this mortality were California flatheaded borer (61% of the trees), dwarf mistletoe (61%) and Fomes annosus (48%). These three pests either alone or in combination were responsible for 90% of the tree mortality.

OZONE INJURY TO PINES. The Forest Service monitored ozone injury to pines on National Forest trend plots in Ventura, Kern, Fresno, and Tulare Counties. Injured ponderosa and Jeffrey pines were rated according to a system used for many years in the San Bernardino Mountains. Overall, plot trees continued to be slightly injured, substantially unchanged since the plots were established in 1974.

The Forest Service monitored ozone at three sites in Tulare County: Whitaker's Forest (University of California) from January through December; Park Ridge Lookout (Kings Canyon National Park) from April through October; Mountain Home State Forest (California Department of Forestry) from August through October. Maximum hourly measurements were similar at all three sites, with Whitaker's recording the highest maxima (11-15 parts per hundred million). From mid-July through mid-September, ozone levels at Whitaker's Forest exceeded the State Standard (10 pphm) on 32 days, more than twice as often as in 1976; the Federal Standard (8 pphm) was exceeded on 51 days. Monitoring will continue through 1978.

TEHACHAPI MOUNTAINS EVALUATION. In May, Forest Service entomologists and pathologists made a biological evaluation of all forested lands within the proposed 12,000 acre Tehachapi Watershed Project. This evaluation was done as an integral part of an environmental assessment of the project by the Soil Conservation Service. The evaluation was designed to account for present and possible future effects of tree pests and to provide management alternatives for preventing or reducing those effects.

STATUS AND CONTROL OF DISEASES

WEATHER. The drought has continued almost unabated for the second year. Except for the month of May, when rainfall was average of above, abnormally low rainfall has been one of the dominant factors influencing the insect and disease situation in the California forests north of the Tehachapi Mountains.

Most of the mortality observed this summer that could be directly or indirectly associated with the drought was the result of reduced rainfall in 1976. This fall, however, there has been a noticeable increase in the amount of mortality that is attributable to the continuing drought. This mortality will probably increase through the winter and spring of 1977-1978.

FOLIAGE DISEASES. The drought has reduced the number of reported incidences of observed damage caused by foliage diseases. However, in 1976 there was enough rainfall in the spring to allow Lophodermella arcuata to continue as a problem on sugar pine in Calaveras, Placer and Tuolumne Counties. In southern California, the 1977 spring tropical storms created conditions favorable for an epidemic of sycamore authracnose on sycamore in Los Angeles County.

ROOT DISEASES. Fomes annosus continues to be a problem on recreation sites in southern California. Biological evaluations conducted on the San Bernardino and Cleveland N.F. determined that F. annosus and/or dwarf mistletoe in combination with insects was responsible for the majority of the pine mortality on recreation sites on these two southern California forests.

F. annosus was also reported killing red and white fir in the Lake Tahoe Basin at Tahoe City and Homewood.

In the area evaluated, the principal pests found associated with dead Jeffrey pine were the California flatheaded borer, Melanophila californica; dwarf mistletoe; shoestring root fungus, Armillaria mellea; and annosus root rot, Fomes annosus. Dwarf mistletoe and flatheaded borers were associated with almost all of the dead Jeffrey pine; dwarf mistletoe, flatheaded borers and one or both of the root diseases were found on one-half of the mortality.

Three pests, namely annosus root rot, the flatheaded fir borer, Melanophia drummondi and the fir engraver beetle, Scolytus ventralis were associated with white fir mortality. Top-killed white fir, suggesting attacks by scolytus were in evidence throughout the watershed, but mortality seemed to be associated most often with a combination of root rot/flatheaded borer/engraver beetle activity.

A vertebrate pest -- quite possibly a kind of ground squirrel -- plays a major role in the death of digger pine in this area. Digger pine is heavily infected with dwarf mistletoe and it appears that the ground squirrels feed on the dwarf mistletoe cankers causing partial and whole branch mortality. As the trees become progressively weaker, flatheaded borers ultimately cause tree death.

Armillaria mellea was found killing red and/or white fir, as part of a pest complex, which included dwarf mistletoe or true mistletoe and insects. On the Lassen, Plumas, Tahoe and Stanislaus N.F., it was found in association with dwarf mistletoe and insects, on both red and white fir. It is not known whether A. mellea is acting as a primary pathogen on true fir or a weak pathogen taking advantage of trees under stress due to numerous dwarf mistletoe infections and drought.

On the Sequoia N.F., A. mellea was acting as a primary pathogen killing red fir and sugar pine in an area where the red fir was heavily infected with true mistletoe.

NURSERY DISEASES. Fusarium sp. was a major problem at Federal (F) and State (S) nurseries.

This fungus caused significant losses in 1-0 Douglas-fir at Humboldt (F) Nursery and in 1-0 sugar pine and red fir at Magalia (S) and Placerville (F) Nurseries. At the Chico Tree Improvement Center (F), more than 50% of their containerized rust resistant 1-0 sugar pine were also killed by Fusarium sp.

At Humboldt (F) Nursery, Botrytis cinerea was a problem in 1-0 coast redwood. Strains of B. cinerea resistant to control using benomyl have been recognized for a number of years in the industry containerized nurseries on the north coast. This year, a resistant strain may be infecting coast redwood bare root stock. This strain has not been tested for resistance, but benomyl is not controlling the spread of the fungus.

NURSERY DISEASE CONTROL:

1. Macrophomina phaseoli. The three registered mixtures of methyl bromidechloropicrin (67-33, 75-25, 982) were evaluated to determine which mixture was most effective in controlling M. phaseoli at a rate of 400 lbs/acre. All the mixtures were equally effective.

2. Botrytis cinerea. A number of chemical compounds were tested in a containerized green house to determine the most effective chemicals for

controlling B. cinerea. Dicloran (Botran) and chlorothanil (Bravo) were significantly better than the other chemicals tested.

AIR POLLUTION (OZONE). Ozone injury symptoms to ponderosa and Jeffrey pines are present throughout the forests adjacent to the San Joaquin Valley, from Tuolumne County south to Kern County. Further to the east, at greater distance from urban pollution sources, injury symptoms are infrequent. (For information on injury trend plots and ozone monitoring, see SURVEYS AND EVALUATIONS, Page 7).

STATUS AND CONTROL OF ANIMAL PESTS

Pocket Gophers. Pocket gopher damage continued to be a major obstacle to the successful establishment of coniferous plantations in most of the commercial timber areas. Increased damage occurred in sections of Modoc, Siskiyou, Shasta and Lake Counties and in the northern and central Sierra Nevada. The chief control method used was baiting with strychnine treated oats. Minor use was made of traps and Vexar sleeves.

Porcupine. Porcupine damage to coniferous seedlings, saplings and poles was widespread in the northern forests, the northern coast range and the Sierra Nevada south to Mariposa County. Numerous local increases in damage occurred throughout this area. Shooting, trapping, and strychnine salt blocks were used as controls.

Deer. Deer browsing of coniferous seedlings and saplings in natural stands and plantations occurred throughout the State. Damage increased in young plantations of Ponderosa pine and true firs in Modoc and Siskiyou Counties and in the northern and central Sierra Nevada. Increased damage also occurred in new to fifteen year old Douglas-fir plantations in Mendocino and Humboldt Counties. Hunting, fencing, and repellents were employed as controls in a few localities.

Minor Pests: The animals listed here caused damage in the counties noted. Damage was severe in some areas but it was generally not widespread.

Species	County
Antelope	Lassen, Modoc
Birds	Amador, El Dorado, Del Norte, Humboldt
Beaver	Lassen, Modoc, Nevada, Plumas, Tuolumne, Monterey, Humboldt, Del Norte
Black Bear	Del Norte, Humboldt
Dusky-footed Wood Rat	Del Norte, Humboldt, Mendocino, Modoc, Lassen
Elk	Del Norte, Humboldt
Meadow Mouse	Del Norte, Humboldt, Mendocino
Mountain Beaver	Del Norte, Humboldt
Rabbits	Modoc, Lassen, Plumas, Shasta, Placer, El Dorado, Amador, Calaveras, Yuba, Butte, Sierra, Colusa, Glenn, Del Norte, Humboldt, Trinity, Mendocino, Lake, San Diego
Small Seed-eating Mammals	Modoc, Eldorado, Amador, Del Norte, Humboldt, Mendocino
Tree Squirrels	Del Norte, Humboldt, Mendocino, Lake, Modoc, Lassen, Amador, El Dorado, Alpine, Calaveras, Tuolumne, Mariposa, Colusa, Glenn, Riverside, San Bernardino
Domestic Livestock	Modoc, Lassen, Plumas, Tuolumne, Del Norte, Humboldt, Mendocino, Shasta, Siskiyou

TABLE 1

INSECT CONTROL ACTIONS RECOMMENDED - 1977

NORTHERN CALIFORNIA COMMERCIAL AND RECREATIONAL FORESTS

INFESTATION AREA	ACREAGE (Est.)	COUNTY	INSECT	HOST	RECOMMENDED ACTION
K BEETLES					
thern California	--	--	Db, Dj, Dm, Dp, Ips, Mc, Md, Sv	Conifers	Surveillance, Evaluate Salvage, Maint. Control
thwest California	200,000	Siskiyou	Md	DF	Evaluate, Salvage
Pablo Res.	100	Contra Costa	Dv, Ips	MP	Salvage, Convert to native vegetation
OLIATORS					
tewide	--	--	Gm	O	Surveillance
tewide	--	--	Op	WF	Surveillance, Evaluate, Research

PLANTATIONS AND SEED ORCHARDS

d Orchards	100	Northern California	Da	PP	Treat fresh grafts with 1% Lindane
ntations	--	Statewide	Eu, Zh, Cp, Rz	Conifers	EC in spring. Surveillance, Evaluate

STATE AND NATIONAL PARKS

sen Volcanic National Park	3,000	Shasta, Lassen	Dj, Db, Dm	JP, PP, SP, LP	Surveillance
uoia-Kings Canyon National Park	2,500	Fresno, Tulare	Dj, Db, Dm	JP, PP, SP, LP	Surveillance, Evaluate
emite National Park	1,200	Mariposa, Tuolumne	Dj, Db, Dm	JP, PP, SP, Lp	Surveillance, Evaluate
emite National Park	100,000	Tuolumne	Cm	LP	Surveillance, Research

SOUTHERN CALIFORNIA RECREATION FORESTS

head-Crestline	47,000	San Bernardino	Dm, Db, Ips, Dj	PP, CP, JP	Sanitation, maint. control*
oyo -Seco District	3,000	Los Angeles	Db, Ips, Mc	PP, Cp, JP	Surveillance
Bear Valley	8,800	San Bernardino	Dj, Ips, Mc, Sv	JP, WF	Sanitation, Maint. control*
llwild-San Jacinto	37,000	Riverside	Mc, Db, Ips, Dm	PP, CP, JP	Sanitation, maint. control*
Baldy District	1,500	Los Angeles	Ips, Dj, Dm, Mc	PP, JP, CP	Surveillance
Pinos District	24,000	Ventura	Ma	Pe	Surveillance
Pinos District	7,900	Ventura, Kern	Mc, Ips	JP	Surveillance
ger Peak-Figueroa Mtn.	700	Santa Barbara	Db, Ips, Dv	PP, CP	Surveillance
Gorgonio District	25,000	San Bernardino	Db, Dj, Ips	PP, JP, CP	Sanitation, maint. control*
w Valley-Big Bear-Santa Ana	3,000	San Bernardino	C sp.	JP	Evaluate, research
yermo District	14,600	Los Angeles	Mc, Ips	JP	Surveillance
ghtwood	2,000	San Bernardino	Mc, Ips	JP	Maintenance Control*

PEST ABBREVIATIONS

- Fir coneworm
sp. - Jeffrey pine needle miner
- Lodgepole needle miner
- Pine resin midge
- Western pine beetle
- Jeffrey pine beetle
- Mountain pine beetle

Dp - Douglas-fir beetle
Dv - Red turpentine beetle
Eu - Eucosma
Gm - Gypsy moth
Ips - Pine ips
Ma - Pinyon needle scale

Mc - California flatheaded borer
Mc - Flatheaded fir borer
Op - Douglas-fir tussock moth
Rz - Ponderosa pine tip moth
Sv - Fir engraver beetle
Zh - Needle sheath miner

HOST ABBREVIATIONS

CP - Coulter pine
DF - Douglas-fir
JP - Jeffrey pine
LP - Lodgepole pine
MP - Monterey pine
O - Oak
PE - Pinyon
PP - Ponderosa pine
SP - Sugar pine
WF - White fir

*Maintenance Control is defined as suppression measures applied continually or annually (seasonally) in an effort to keep tree losses at a tolerable level. Suppression measures may include logging, wood cutting, felling and burning, or insecticide application on infested trees. Based on the Council's 1971 Resolution, it is recommended that chemicals be used only when non-insecticidal alternatives of suppression are not suitable.

TABLE II

FOREST DISEASE REPORTED - 1977

Causal Agent	Host	County
RUSTS		
White pine blister rust	SP	Amador
	SP	Tulare (3)
MISTLETOES		
Dwarf mistletoe	WF	Shasta
	WF	San Bernardino
CANKER DISEASES		
Dermea canker	DF	Trinity (2)
Cytospora canker	WF	Shasta
Unknown canker diseases	RF, WF	Plumas
FOLIAGE DISEASES		
Sugar pine needle cast	SP	Tuolumne
Sycamore anthracnose	Syc	Los Angeles
Sugar pine needle cast	SP	Calaveras
Sydowia polyspora	WF	Sierra
ROOT DISEASES		
Armillaria root disease	CP	San Diego
annosus root disease	WF	Plumas
	WF	Shasta
	WF, RF	Placer (2)
	CP	San Diego (2)
	JP	San Bernardino
	WF	Trinity
Black stain root disease	DF	Lake
ABIOTIC DISEASES		
Air pollution (Ozone)	PP	Kern
Chemical	PP	Placer
	PP,WF	Calaveras
Drought	MuP	Sonoma
	IC	Modoc
	PP	Del Norte
Physiological drought	DF	Trinity
Weather	CP	San Bernardino
NURSERY DISEASES		
Botrytis cinerea	RW	Humboldt
	JP	San Bernardino

Causal Agent	Host	County
NURSERY DISEASES (cont'd)		
Fusarium oxysoporum	RF, SP	Butte
	DF	Humboldt
	SP, WF, RF	El Dorado
	PP	Tulare
Phytophthora sp.		

FOMES ANNOSUS IN RED AND WHITE FIR

Red and white firs constitute about one-fourth of the standing timber volume in California. Until recently, this fir resource has received relatively little attention, and the information essential to sound management has not been developed. Among the potential, but as yet inadequately evaluated, problems in fir stands, Fomes annosus root and butt rot may be a major factor affecting fir productivity.

EPIDEMIOLOGY AND HOST RANGE. Fomes annosus, a fungus related to the many wood decay fungi, spreads in forest stands by at least two ways: spores and mycelium. The sporophores, often called "conks", that produce the airborne spore stage are found in decayed stumps or under the bark of stumps and snags. Spore trapping studies and incubation of wood discs from stumps or from trees with basal wounds indicate that the air frequently contains large numbers of spores and that most freshly cut stump surfaces, and perhaps basal wounds, are liable to infection.

When a stump or tree has been colonized, the mycelium of the fungus can grow along and through roots. Where infected roots contact the roots of nearby trees, the fungus spreads to these trees. Thus an enlarging "center" or "pocket" of disease develops in a stand. The rate at which such centers enlarge in firs is unknown. In pine centers the fungus often spreads 2-4 feet per year, killing trees of all ages. Age relationships have not been determined for firs.

Fomes annosus attacks most conifers and occasionally is found on some California hardwoods such as manzanita, madrone, and alder. There is no clear evidence of specialized forms in F. annosus, but field observations suggest that the fungus does not spread readily from fir to pine through roots. Since reforestation of infection centers may depend upon how readily the fungus spreads from one species to another, data on interspecific spread is needed.

MECHANISMS OF DAMAGE. In pines, F. annosus attacks the cambium and outer sapwood, leading to rapid death of trees. In firs, the fungus usually attacks the "heartwood" and "inner sapwood", causing a stringy to laminated white rot of roots and butts. As decay progresses, losses of several kinds result.

Direct killing of firs is seldom observed. Rather, as decay proceeds, trees are gradually weakened and water uptake is apparently impaired. Such trees become susceptible to attack by the fir engraver beetle or by flatheads. If trees escape beetle attack, decay often proceeds to the point of structural failure, leading to windthrow. Trees that escape beetle attack or windthrow frequently develop extensive butt rot. Additionally, growth reduction is associated with F. annosus infection in small firs, and circumstantial evidence suggests that infection may promote wetwood development.

INCIDENCE AND IMPACT IN FIR. The impact of F. annosus on fir productivity has not been evaluated adequately. Data from Pest Damage Inventories made on the Eldorado, Stanislaus, and San Bernardino National Forests indicated that F. annosus was involved in one third to two thirds of the true fir mortality at each location, often in conjunction with Scolytus ventralis. In another survey F. annosus was found in 27 of 46 fir mortality centers on the Eldorado N.F. The actual incidence of F. annosus in the above evaluations was likely considerably higher, since the disease is difficult to detect in large trees or in trees in which the roots but not the butt have been attacked. When live trees (70-90 yrs) were uprooted on 10 fortieth acre plots selected randomly in a stand scheduled for thinning on the Lassen N.F., F. annosus infections were confirmed on 5 plots, indicating a high incidence of infection per acre before thinning. One year after thinning, incubation of discs from 100 stumps showed that more than one third were colonized by F. annosus. Invasion of stumps and of basal wounds on leave trees could cause considerable root and butt decay before the next stand entry (10 yrs).

These data, plus observations on the frequency of windthrow and butt rot, indicate that F. annosus is widely distributed and damaging in California fir stands, and that the effects of thinning fir stands should be carefully evaluated.

DIAGNOSIS. The presence of F. annosus can be confirmed in several ways. Enlarging centers of mortality, with old decayed or fallen snags in the middle and recently killed trees at the margin, generally indicate F. annosus. Examination of stumps and snags for the stringy to laminated white rot of roots and butts provides further evidence. Often, chopping apart old stumps reveal conks of F. annosus within hollows or beneath the bark. Conks have a cream colored, finely-pored undersurface and a tan to gray-black uppersurface, depending on age and exposure. They range from less than 1 inch to more than 6 inches across and may occur singly or in tiered clusters.

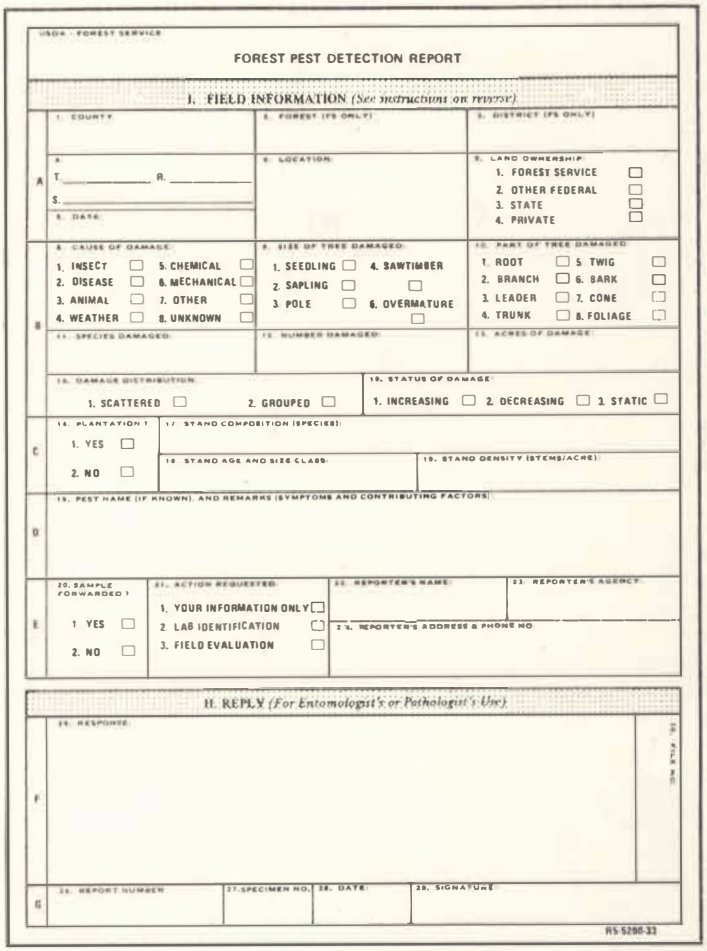
Where single trees or small groups of trees have been killed, particularly if mortality is recent, none of the above indicators may be evident. In such cases, positive identification often can be made by incubating discs taken at stump height and examining the surface for the conidial spore stage. If the fungus has not yet reached stump height, positive identification requires uprooting or excavation to obtain root samples for isolation. Since these procedures are time consuming and often difficult, they are seldom used except for research.

MANAGEMENT IMPLICATIONS. Few data are available to guide managers of fir stands infested with F. annosus. Work is in progress at PSW, R-5, and UCB to develop information needed to provide guidelines, but at present the amount of information is largely inadequate. It has been established that treatment with borax prevents infection of stumps, but use of stump treatment in harvest or thinning cuts needs evaluation.

The Forest Service has developed guidelines, based mainly on terminal growth and needle retention, for recognition of small infected trees within infection centers. Early removal of such trees might reduce losses, but field testing of efficacy is needed.

It is likely that timing of thinning or harvest cuts, manipulation of stand composition and density, prescribed burning, and similar "tools" may ultimately be useful in reducing the impact of F. annosus in firs. These possibilities require critical study before sound recommendations can be developed.

FOREST PEST DETECTION REPORT. This Conditions Report is compiled from information recorded on this form by Federal, State, and private forest managers and individuals. The accuracy and completeness of the data reported here depends on the care with which people concerned with forests report incidents of damage caused by insects, diseases, animals, weather, chemicals, and air pollution. The form is available at local offices of the Forest Service, or from the California Department of Forestry.



USDA - FOREST SERVICE

FOREST PEST DETECTION REPORT

I. FIELD INFORMATION *(See instructions on reverse)*

A
1. COUNTY
2. FOREST (FS ONLY)
3. DISTRICT (FS ONLY)
4. T _____ R. _____ S. _____
5. DATE
6. LOCATION
7. LAND OWNERSHIP
1. FOREST SERVICE ☐
2. OTHER FEDERAL ☐
3. STATE ☐
4. PRIVATE ☐

B
8. CAUSE OF DAMAGE
1. INSECT ☐ 5. CHEMICAL ☐
2. DISEASE ☐ 6. MECHANICAL ☐
3. ANIMAL ☐ 7. OTHER ☐
4. WEATHER ☐ 8. UNKNOWN ☐
9. SIZE OF TREE DAMAGED
1. SEEDLING ☐ 4. SAWTIMBER ☐
2. SAPLING ☐
3. POLE ☐ 6. OVERMATURE ☐
10. PART OF TREE DAMAGED
1. ROOT ☐ 5. TWIG ☐
2. BRANCH ☐ 6. BARK ☐
3. LEADER ☐ 7. CONE ☐
4. TRUNK ☐ 8. FOLIAGE ☐
11. SPECIES DAMAGED
12. NUMBER DAMAGED
13. ACRES OF DAMAGE
14. DAMAGE DISTRIBUTION
1. SCATTERED ☐ 2. GROUPED ☐
15. STATUS OF DAMAGE
1. INCREASING ☐ 2. DECREASING ☐ 3. STATIC ☐

C
16. PLANTATION ?
1. YES ☐
2. NO ☐
17. STAND COMPOSITION (SPECIES)
18. STAND AGE AND SIZE CLASS
19. STAND DENSITY (STEMS/ACRE)

D
19. PEST NAME (IF KNOWN), AND REMARKS (SYMPTOMS AND CONTRIBUTING FACTORS)

E
20. SAMPLE FORWARDED ?
1. YES ☐
2. NO ☐
21. ACTION REQUESTED
1. YOUR INFORMATION ONLY ☐
2. LAB IDENTIFICATION ☐
3. FIELD EVALUATION ☐
22. REPORTER'S NAME
23. REPORTER'S AGENCY
24. REPORTER'S ADDRESS & PHONE NO.

II. REPLY *(For Entomologist's or Pathologist's Use)*

F
25. RESPONSE
26. FILE NO.

G
27. REPORT NUMBER
27. SPECIMEN NO.
28. DATE
29. SIGNATURE

FS-5200-33